

Listing of Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application.

1-17.(canceled)

18.(currently amended) A method for treating groundwater and/or soil comprising:

- a) conducting two or more different reagents separately through two or more conduits residing in a bore hole;
- b) dispensing said two or more different reagents into said bore hole through injection ports associated with said two or more conduits, wherein at least one of said reagents is an oxidizing agent, and at least one of said reagents is capable of forming hydroxyl radicals by contacting said oxidizing agent;
- c) preventing substantial contact of said two or more reagents with each other in said bore hole; and
- d) forming hydroxyl radicals outside said bore hole by contacting of said two or more reagents outside said bore hole.

19.(Previously presented.) The method of claim 18 wherein said preventing of substantial contact of said two or more reagents in said bore hole is facilitated with at least one diffusion barrier placed between said injection ports.

20.(Previously presented.) The method of claim 18 wherein said two or more reagents are conducted through two conduits.

21-22.(canceled)

23.(Previously presented.) The method of claim 18 wherein said injection ports comprise a diffuser, well screen, or sprayer.

24.(canceled)

25.(Previously presented.) The method of claim 18 wherein at least one reagent is a gas and at least one further reagent is a liquid.

26.(Previously presented.) The method of claim 25 wherein said liquid flows through said conduit at a flow rate between about 0.5 and 25 gpm.

- 27.(Previously presented.) The method of claim 25 wherein said liquid flows through said conduit at a flow rate of about 0.5 gpm.
- 28.(Previously presented.) The method of claim 25 wherein said gas flows through said conduit at a flow rate between about 0.1 and 150 scfm.
- 29.(Previously presented.) The method of claim 25 wherein said gas flows through said conduit at a flow rate above about 15 scfm.
- 30.(currently amended) The method of claim 25 wherein said gas comprises ozone, oxygen, or air.
- 31.(Previously presented.) The method of claim 25 wherein said gas comprises ozone.
- 32.(Previously presented.) The method of claim 25 wherein said gas comprises air.
- 33.(Previously presented.) The method of claim 25 wherein said liquid comprises hydrogen peroxide.
- 34.(Previously presented.) The method of claim 18 wherein said two or more reagents are pulsed through said conduits.
- 35.(Previously presented.) A method for treating groundwater and/or soil comprising:
- a) conducting a gaseous reagent comprising ozone through a first conduit residing in a bore hole and conducting a liquid reagent comprising hydrogen peroxide through a second conduit residing in said bore hole;
 - b) dispensing said reagents into said bore hole through injection ports associated with each of said conduits;
 - c) preventing substantial contact of said gaseous and liquid reagents with each other in said bore hole; and
 - d) forming hydroxyl radicals outside said bore hole by contacting of said gaseous and liquid reagents outside said bore hole.
- 36.(Previously presented.) The method of claim 35 wherein said gaseous reagent flows through said conduit at a flow rate above about 15 scfm .
- 37.(Previously presented.) The method of claim 35 wherein said gaseous reagent flows through said conduit at a flow rate up to about 40 scfm.
- 38.(Previously presented.) The method of claim 35 wherein the concentration of ozone in said gaseous reagent is between about 1,000 ppmv and about 100,000 ppmv.
- 39.(Previously presented.) A system for treating groundwater and/or soil comprising:

- a) one conduit for conducting two or more different reagents into said groundwater and/or soil through a bore hole;
- b) one injection port associated with said conduit for dispensing said two or more different reagents;
- c) a diffusion barrier placed in said conduit above said injection port, isolating reagent injection location to a minimum depth within the borehole .

40.(original) The system of claim 39 wherein said diffusion barrier comprises a well packer.

41.(original) The system of claim 39 wherein said bore hole is packed with sand around said injection port.

42.(original) The system of claim 39 wherein said injection port comprises a diffuser, well screen, or sprayer.

43.(original) The system of claim 39 wherein said reagents comprise air and hydrogen peroxide.

44.(original) The system of claim 39 wherein said reagents flow through said conduit at a flow rate of about 0.5 gpm to 20 gpm.

45.(original) The system of claim 39 wherein said reagents flow through said conduit at about 1 scfm to 30 scfm.

46.(original) The system of claim 39 wherein said system comprises a reagent line for gas and a reagent line for liquid in said conduit, wherein said reagent lines terminate within said injection port.

47.(original) The system of claim 46 wherein said reagent lines each terminate at different points within said injection port.

48.(original) The system of claim 46 wherein a further diffusion barrier is placed in said conduit between the termini of the reagent lines.

49.(original) The system of claim 48 wherein said further diffusion barrier is a well packer.

50.(original) The system of claim 46 wherein said gas flows through said reagent line at a flow rate from about 0.1 to about 150 scfm.

51.(original) The system of claim 46 wherein said gas flows through said reagent line at a flow rate from about 1 to about 30 scfm.

52.(original) The system of claim 46 wherein said gas flows through said reagent line at a flow rate above about 15 scfm.

53.(original) The system of claim 46 wherein said liquid flows through said reagent line at a flow rate between about 0.5 and about 25 gpm.

54.(original) The system of claim 46 wherein said liquid flows through said reagent line at a flow rate between about 0.5 gpm and about 10 gpm.

55.(original) The system of claim 46 wherein said liquid flows through said reagent line at a flow rate between about 2 gpm and about 5 gpm.

56.(original) The system of claim 46 wherein said liquid flows through said reagent line at a flow rate of about 0.5 gpm.

57.(original) The system of claim 46 wherein said gas comprises air and said liquid comprises hydrogen peroxide.

58.(Previously presented.) A method of treating a body of water and/or soil comprising injecting two or more reagents into said body of water and/or soil using the system of ~~claim 1~~ or claim 39.

59.(original) The method of claim 58 wherein said body of water is groundwater.

60.(original) The method of claim 58 wherein said treating occurs in situ.

61.(original) The method of claim 58 wherein said two or more reagents comprise air and hydrogen peroxide or ozone and hydrogen peroxide.

62.(original) The method of claim 58 wherein at least one reagent is hydrogen peroxide which is injected at a flow rate above about 0.5 gpm.

63.(original) The method of claim 58 wherein at least one reagent is hydrogen peroxide which is injected at a flow rate at or above about 2 gpm.

64.(Previously presented.) A method of reducing organic compounds dissolved or suspended in a body of water and/or soil comprising injecting two or more reagents into said body of water and/or soil using the system of claim 39.

65.(currently amended) The method of claim 64 wherein said organic compounds are VOCs, MTBE, BTEX, TBA, TAME, PCBs, NVOCs, or petroleum hydrocarbons.

66.(Previously presented.) A method of increasing dissolved oxygen in a body of water and/or soil comprising injecting two or more reagents into said body of water and/or soil using the system of claim 39.

67.(Currently amended.) A method of treating groundwater and/or soil comprising contacting two or more reagents, wherein at least one of said reagents is an oxidizing agent, and at least one of said reagents is capable of forming hydroxyl radicals by contacting said oxidizing agent, wherein said contacting occurs after said two or more reagents have diffused into said groundwater and/or soil from separate conduits or separate points at an injection port within a single conduit, where said separate conduits or separate points are separated by a diffusion barrier, and wherein said contacting produces hydroxyl radicals.

68.(canceled)

69.(original) The method of claim 67 wherein said groundwater and/or soil is in a container.

70.(canceled)

71.(original) The method of claim 67 wherein at least one of said two or more reagents oxidizes organic molecules dissolved or suspended in said groundwater and/or adsorbed in said soil.

72.(original) The method of claim 67 wherein said contacting produces a further reagent that can react with organic molecules dissolved or suspended in said groundwater and/or adsorbed in said soil.

73.(original) The method of claim 67 wherein one of said two or more reagents comprises hydrogen peroxide and another of said two or more reagents comprises one or more of ozone, oxygen, and/or air.

74.(original) The method of claim 67 wherein said organic molecules comprise pollutants.

75.(Previously presented.) The method of claim 74 wherein said pollutants are VOCs, MTBE, BTEX, TBA, TAME, PCBs, NVOs, or petroleum hydrocarbons.

76.(original) The method of claim 67 wherein said two or more reagents are injected below ground into said water and/or soil.

77.(original) The method of claim 67 wherein two of said two or more reagents are ozone and hydrogen peroxide.

78.(original) The method of claim 67 wherein two of said two or more reagents are air and hydrogen peroxide.

79.(original) The method of claim 77 wherein said ozone is injected into the ground at a deeper level than said hydrogen peroxide.

80.(original) The method of claim 67 wherein said diffusion barrier is located inside said bore hole.

81.(original) The method of claim 67 wherein said diffusion barrier is located inside a conduit.

82.(original) The method of claim 81 wherein said diffusion barrier is a well packer.

83.(original) The method of claim 67 wherein said bore hole is about 2 to about 12 inches in diameter and about 2 to about 100 feet deep.

84.(original) The method of claim 67 wherein said bore hole is packed with sand at said injection ports.

85.(original) The method of claim 67 wherein said diffusion barrier comprises bentonite or grout in said bore hole.

86.(Currently amended.) A method of reducing organic compounds dissolved, absorbed, or suspended in a body of water and/or soil comprising:

a) conducting two or more different reagents into said body of water and/or soil separately through two or more conduits residing in a bore hole;

b) dispensing said two or more different reagents into said bore hole through injection ports associated with said two or more conduits, wherein at least one of said reagents is an oxidizing agent, and at least one of said reagents is capable of forming hydroxyl radicals by contacting said oxidizing agent;

c) preventing substantial contact of said two or more reagents with each other in said bore hole; and

d) forming hydroxyl radicals outside said bore hole by contacting of said two or more reagents outside said bore hole

e) allowing the formed hydroxyl radicals to contact said body of water and/or soil to reduce organic compounds dissolved, absorbed, or suspended in a body of water and/or soil.

87.(Previously presented.) The method of claim 86 wherein said organic compounds are VOCs, MTBE, BTEX, TBA, TAME, PCBs, NVOCs, or petroleum hydrocarbons.

88.(Currently amended.) A method of increasing dissolved oxygen in groundwater and/or soil comprising:

a) conducting two or more different reagents into said groundwater and/or soil separately through two or more conduits residing in a bore hole;

b) dispensing said two or more different reagents into said bore hole through injection ports associated with said two or more conduits, wherein at least one of said reagents is an oxidizing agent, and at least one of said reagents is capable of forming hydroxyl radicals by contacting said oxidizing agent;

c) preventing substantial contact of said two or more reagents with each other in said bore hole; and

d) forming hydroxyl radicals outside said bore hole by contacting of said two or more reagents outside said bore hole

e) allowing the formed hydroxyl radicals to contact said groundwater and/or soil to increase dissolved oxygen in said groundwater and/or soil.

89.(Previously presented.) The method of claim 18 wherein said groundwater or said soil is in a container.

90.(Previously presented.) The method of claim 89 wherein said container is above ground.

91.(Previously presented.) The method of claim 18 wherein said reagents comprise persulfate, hydrogen peroxide, ozone, oxygen, air, sodium permanganate, potassium permanganate, calcium peroxide, iron, catalyst, nutrients, carbon, or acid, or water solution thereof.

92.(Previously presented.) The method of claim 18 wherein one of said two or more different reagents further comprises persulfate.

93.(Previously presented.) The method of claim 19 wherein said diffusion barrier comprises bentonite or grout.

94.(Previously presented.) The method of claim 25 wherein said liquid comprises persulfate.

95.(Previously presented.) The method of claim 35 wherein said preventing of substantial contact of said two or more reagents in said bore hole is facilitated with at least one diffusion barrier placed between said injection ports.

96.(Previously presented.) The method of claim 94 wherein said diffusion barrier comprises bentonite or grout.

97.(Previously presented.) The system of claim 39 wherein said two or more different reagents are each independently selected from persulfate, hydrogen peroxide, ozone, oxygen, air, sodium permanganate, potassium permanganate, calcium peroxide, iron, catalyst, nutrients, carbon, and acid, or water solution thereof.

98.(Previously presented.) The system of claim 39 wherein:

one of said reagents comprises air, oxygen, or ozone; and
one of said reagents comprises hydrogen peroxide.

99.(Previously presented.) The system of claim 39 wherein said reagents further comprise persulfate.

100.(Previously presented.) The system of claim 39 wherein said groundwater or said soil is in a container.

101.(Previously presented.) The system of claim 99 wherein said container is above ground.

102.(Previously presented.) The system of claim 46 wherein:

said gas comprises air, oxygen, or ozone; and
said liquid comprises hydrogen peroxide.

103.(Previously presented.) The method of claim 58 wherein said reagents each independently comprise persulfate, hydrogen peroxide, ozone, oxygen, air, sodium permanganate, potassium permanganate, calcium peroxide, iron, catalyst, nutrients, carbon, or acid, or water solution thereof.

104.(Previously presented.) The method of claim 58 wherein said reagents each independently comprise hydrogen peroxide and persulfate.

105.(Previously presented.) The method of claim 67 wherein said reagents each independently comprise persulfate, hydrogen peroxide, ozone, oxygen, air, sodium permanganate, potassium permanganate, calcium peroxide, iron, catalyst, nutrients, carbon, and acid, or water solution thereof.

106.(Previously presented.) The method of claim 67 wherein said reagents each independently comprise hydrogen peroxide and persulfate.

107.(Previously presented.) The method of claim 67 wherein:

one of said reagents comprises air, ozone, or oxygen; and
one of said reagents comprises hydrogen peroxide.

108.(Previously presented.) The method of claim 67 wherein one of said two or more reagents further comprises persulfate.